

Randi Korn & Associates, Inc.

118 E. Del Ray Avenue, Alexandria, VA 22301 Voice: 703-548-4078 Fax: 703-548-4306 www.Randikorn.com

**Summative Evaluation:
Executive Summaries, Discussion, and Recommendations**

**Life Tech Gallery
Innovation Gallery
Exploration Gallery
Communication Gallery**

**Prepared for
The Tech Museum of Innovation**

**By
Randi Korn & Associates, Inc.**

February 2000

Audience Research

Evaluation

Exhibit Development

TABLE OF CONTENTS

Introduction..... 1

Discussion and Recommendations4

Communication Gallery Executive Summary23

Exploration Gallery Executive Summary.....28

Innovation Gallery Executive Summary.....34

Life Tech Gallery Executive Summary40

INTRODUCTION

In May 1999, Randi Korn & Associates, Inc. (RK&A), began a comprehensive summative evaluation of the four permanent galleries¹ and the overall visitor experience of The Tech Museum of Innovation in San Jose, California. For this first phase of evaluation, there were four reports—one for each gallery. This document presents the discussion, recommendations, and executive summaries from Phase I.

Data for this phase were collected in July and August 1999. The evaluation was undertaken to document the scope of the galleries' impact and effectiveness as well as to identify elements in existing components that may need to be adjusted to improve their effectiveness. The specific objectives for Phase I of the summative evaluation were to determine:

- how much time visitors spend in each gallery
- how much time visitors spend at individual components
- the components at which visitors stop
- the environmental features visitors notice
- the frequency of visitors' waiting to use interactive components
- the frequency of visitors' encountering broken exhibits
- visitors' opinions of each gallery
- visitors' cognitive experiences in each gallery.

METHODOLOGY

Three data collection strategies were employed to assess visitors' use of and experiences in each gallery: timing and tracking observations, open-ended exit interviews, and focused observation and interviews.

Timing and Tracking Observations

Visitors are often observed in summative evaluations because observations provide an objective and quantitative account of how visitors behave and react to exhibition components. Observational data suggest the range of visitor behaviors occurring in an exhibition and indicate which components attract, as well as hold, visitors' attention.

All visitors nine years of age and older were eligible to be unobtrusively observed as they used the components in each gallery. The observed individuals were selected following a continuous random sampling method. In accordance with this method, a trained observer was stationed at the entrance of each gallery. The first eligible visitor to enter the exhibition was observed. The observer followed the selected individual through the exhibition, recording components at which he or she stopped, time spent at individual components, and total time spent in the exhibition.

¹ This material is based upon work supported by the National Science Foundation under Grants No. 9705633, 9627196, and 9552566. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Upon the completion of a visit, the observer returned to the entrance to await the next eligible visitor to enter the exhibition.

Open-ended Exit Interviews

The purpose of conducting open-ended interviews is to encourage and motivate interviewees to describe their experiences, express their opinions and feelings, and share with the interviewer the meaning they constructed from an experience. Open-ended interviews produce data rich in information because interviewees talk about their experiences from a very personal perspective. The interview data for Phase I is intended to humanize the numerical observation data.

After visiting each gallery, adults 16 years of age and older were eligible to be selected (following a continuous random sampling method, as described above) to answer several questions about their experience. The interview guide was intentionally open-ended to allow interviewees the freedom to discuss what they felt was meaningful. All interviews were tape-recorded with participants' awareness and transcribed to facilitate analysis.

Focused Observations and Interviews

Focused observations and interviews were conducted to understand in great depth how visitors use specific components, how they respond both cognitively and affectively to the components' content and display techniques, and what they learn from the components. One or two components were selected for study in each gallery.

Following a continuous random sampling method described earlier, interviewers invited eligible visitors (aged 16 years and older who may or may not have been with younger visitors) to use a selected interactive exhibit. This method of recruitment is known as cued testing. Those who agreed to participate used the interactive while the data collector conducted observations. When the visitor(s) finished using the component, he or she participated in an open-ended interview. All interviews were tape-recorded with interviewees' awareness and transcribed to facilitate analysis. Because of the detailed nature of the focused observations and interviews, they are not included in the executive summaries. Consult each gallery's full report for focused observation and interview findings.

DATA ANALYSIS

The timing and tracking data were quantitative, and were entered into a computer to be analyzed statistically. Percents and summary statistics, including the median (point at which half the responses fall above and half fall below), mean (average), and standard deviation (spread of scores: \pm) were calculated for interval and ratio variables. To examine the relationship between

two visitor subsets (e.g., visitor groups with children and those without children), *t*-tests and Mann-Whitney U tests (the nonparametric equivalent to a *t*-test) were computed.²

For the most part, medians rather than means are reported in this document because, as is typical, the number of components used and the time spent by visitors were distributed unevenly across the range. For example, whereas most visitors spent a relatively brief amount of time with exhibition components, a few visitors spent an unusually long time. When a distribution of scores is extremely asymmetrical (i.e., “lopsided”), the *mean* is strongly affected by the extreme scores and, consequently, falls farther away from the distribution’s central area. In such cases, the *median* is the preferred measurement because it is not sensitive to the values of scores above and below it—only to the number of such scores.

The observational data collected for the focused observations and the verbatim responses to the interview questions on each interview guide were analyzed qualitatively, meaning that the evaluator studied the responses for meaningful patterns. As patterns and trends emerged, similar responses were grouped together. Each grouping was then assigned a name or category that conveys the meaning the responses embody.

² A level of significance of $p \leq 0.01$ was used in this study. This means that when a statistical test, such as a test of a relationship, is significant at a probability level of $p \leq 0.01$, the magnitude of the relationship being tested would occur purely by chance fewer than or equal to 1 time in 100 times. Because the odds are so low that the relationship would occur purely by chance, there is sufficient reason to be confident that the relationship really exists. Within the body of the report, only statistically significant results are discussed.

DISCUSSION OF FINDINGS

The evaluation of The Tech Museum of Innovation was comprehensive and complicated. To provide a complete description of visitors' experiences, multiple data collection strategies were employed, including:

- Visitor observations in each gallery to indicate where people went and how long they stayed at exhibits;
- Post-visit, open-ended interviews for each gallery to humanize the behavioral data and explain visitors' qualitative experiences;
- Visitor observations and interviews at five components across the four galleries to identify operational and comprehension problems;
- Post-visit questionnaires to assess whole museum experiences;
- Post-visit open-ended interviews to explain visitors' whole museum qualitative experiences;
- Post-visit telephone interviews with visitors who had been to The Tech three or more months earlier to determine longer-term effects of The Tech.

This summary presents a synthesis of the first three data sets.

The visitor observations and interviews indicate that something different is happening at the galleries in The Tech Museum of Innovation, compared to studies of visitors in other science exhibitions. Randi Korn & Associates, Inc., (RK&A) and other evaluators have found that visitors in science exhibitions often move quickly from component to component, pushing buttons and pulling levers to get a response, without observing the phenomenon or focusing on content. However, visitors did not behave this way in the Tech Museum. Instead, they spent a significant amount of time using fewer exhibits, suggesting that components were compelling.

OVERALL BEHAVIORAL PATTERNS

The timing and tracking observations provide a thorough examination of visitors' behavioral experiences in all four galleries. While visitors' experiences were highly individualized and the galleries themselves are unique, comparing the findings from the four galleries reveal some general trends.

Total Stops and Total Time

One way to assess visitors' experiences is to compare the total number of stops visitors made and the total amount of time spent in each of the galleries. Visitors' total number of stops and total time spent in each of the galleries were very similar. Visitors stopped at a median of 7 to 11 components in each gallery: visitors made the most stops in Life Tech and the fewest in Communication. Visitors spent a median time of 14 to 17 minutes in each gallery; they spent the most time in the Innovation Gallery and the least in the Communication Gallery.

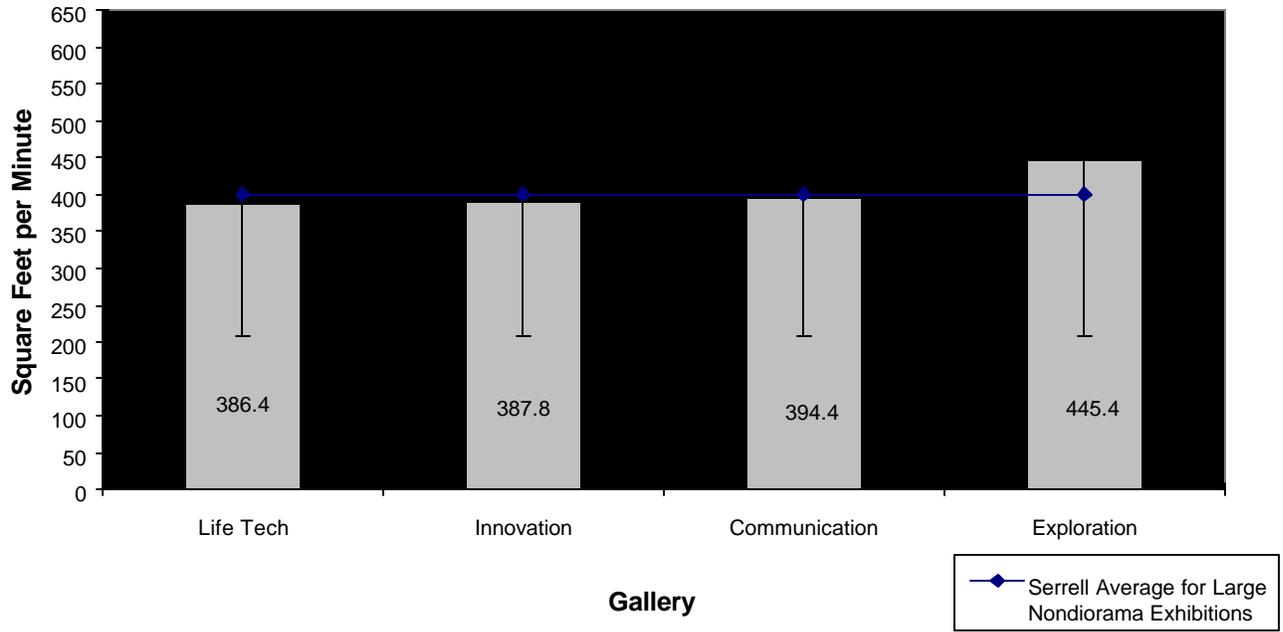
To better understand the total number of stops visitors made and the total time they spent in the gallery, it is helpful to compare these galleries with other exhibitions of similar size. To make such comparisons, Serrell (1997) uses the amount of time visitors spend in exhibitions to calculate the "sweep rate index" (SRI). She also uses the number of components visitors stop at to calculate the "percentage diligent visitors index" (%DV).

The SRI is calculated by dividing the exhibition's square footage by the average total time spent in the exhibition. The lower the SRI, the more time visitors spent per square foot of space. The SRIs for each gallery are presented in Figure 1. Life Tech has the lowest SRI (386 square feet per minute), followed by Innovation (388 square feet per minute), Communication (394 square feet per minute), and Exploration (445 square feet per minute)¹, which are similar to the average SRI Serrell found for large non-diorama exhibitions.² According to the SRI, visitors are going through Life Tech, Communication, and the Innovation Gallery at about the same rate as visitors to exhibitions of similar size. Visitors to the Exploration Gallery are traveling at a somewhat higher rate (e.g., faster), however, still within one standard deviation of Serrell's average SRI. The vertical lines dissecting each bar indicate the large standard deviation for Serrell's average SRI.

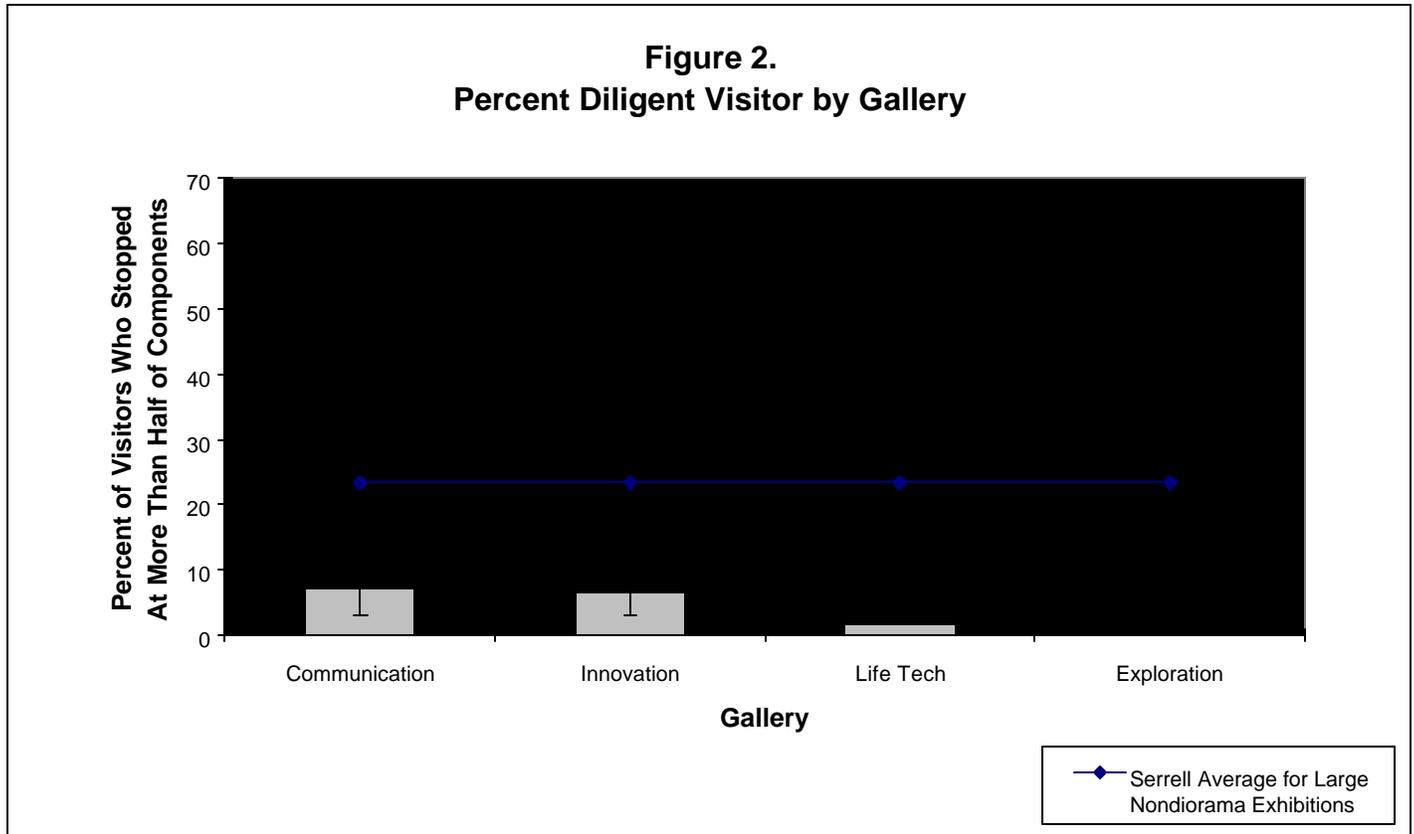
¹ The Life Tech Gallery is 7,870 square feet; the average (mean) total time spent in the gallery was 20.37 minutes. Innovation Gallery is 8,252 square feet; the average total time spent in the gallery was 21.28 minutes. The Communication Gallery is 8,113 square feet; the average total time spent in the gallery was 20.57 minutes. Exploration Gallery is 8,306 square feet; the average total time spent in the gallery was 18.65 minutes. The average total times were used in the SRI calculation in accordance with Serrell's methods. Throughout the rest of the report, the median times are reported, as the median is standard for time data that is unevenly distributed across its range.

² Serrell reports an average SRI of 400.5 (± 191.5) for large (>3,900 square feet) non-diorama exhibitions.

**Figure 1.
Sweep Rate Index by Gallery**



The %DV is obtained by calculating the percentage of visitors who stopped at more than half of the components. The higher the %DV, the more thoroughly the exhibition was used. Figure 2 shows the %DV for each gallery. Communication has the highest %DV (7 percent), followed by Innovation (6 percent), Life Tech (2 percent), and Exploration (0 percent). All are lower than the average %DV Serrell found³, which means visitors stopped at fewer components in each of the galleries, compared to exhibitions of similar size. Again, the vertical lines dissecting each bar indicate the large standard deviation for Serrell’s average %DV.



Some developers object to Serrell’s %DV model, which bases the success of an exhibition on quantity of exhibits stopped at versus the quality of an individual experience, as some developers are more concerned with dwell time than they are with percent of components used. In all fairness, developers’ behavioral objectives are important to consider when discussing %DV. If developers designed their exhibits for high dwell time, and they are content knowing that less than one-quarter of visitors use less than half of what is available to them, the galleries in the Tech Museum have done well.

³ Serrell reports an average %DV of 23.4 percent (± 20.4) for large (>3,900 square feet) non-diorama exhibitions.

But if developers would prefer to see a higher %DV, before becoming too alarmed, they need to realize that there are some constraints to these data that would affect the %DV. For example, visitors may have found certain components particularly compelling and chose to spend their time at those components rather than sampling many different ones. In fact, the gallery exit interviews support that visitors spoke highly of the overall interactive quality of the exhibits and then praised a few specific components. In addition, visitors may have intended to visit the gallery again either on the same day or in the future. Because of the nature of unobtrusive observations, data collectors do not know at what point in the subject's visit the tracking is taking place (i.e., it is impossible to know if the visitor has already visited the gallery or plans to do so again). Furthermore, repeat visitors often have favorite components that they revisit to the exclusion of other components. Repeat visitors may also focus on select exhibits because they know they can always visit again and do not have to see and do everything all at once. According to the preliminary findings⁴ of the visitor survey, about one-fifth of the summer visitors (19 percent) were repeat visitors, a sizeable portion of visitors considering the new building had only been open for eight months at the time of the study. Nevertheless, it is important for developers to think about their own expectations for visitor behaviors. Do they wish to provide visitors with a few in-depth experiences, or do they prefer to offer a range of quick experiences? Developers will either feel good about how visitors have used the spaces, or they will think visitors' behaviors should have been different.

Even though certain variables remain unknown when making sense of behavioral data, dissecting how visitors move through a space and where they select to stop and spend their time show use patterns that can help draw conclusions about visitors' experiences and the successes and shortcomings of an exhibition. In this respect, it is reasonable to ask why Exploration had the lowest %DV, compared to the other galleries.

Exploration is the largest gallery of the four, and it also has the most components. Serrell and others (Korn, 1993) have found that visitors spend less time in large exhibitions than small ones. For visitors, less is often more, which might be a very simple explanation for Exploration's low %DV. Another way to interpret the low %DV is in terms of the types of experiences Exploration offered visitors. Exploration has the highest number of panels without artifacts (21 total)—more than twice as many as in other galleries. As evidenced in the findings from each gallery, and in other studies (Korn 1997; Korn, 1992), panels without artifacts do not perform well in terms of attraction power and holding power. Exploration also has the lowest number of computer interactives, which was a popular component type in the three galleries, both in terms of frequency of stops and amount of time spent. Thus, Exploration has many of the component types that visitors tend to ignore (panels without artifacts) and relatively few that visitors tend to like (computers) both of which may have contributed to the low %DV.

The low %DV for Life Tech (2 percent) deserves some explanation as well. Life Tech was the smallest gallery, but it has 65 components—10 less than Exploration, but more than the other two galleries. It contains 15 computer interactives and 14 mechanical interactives. More than half of visitors stopped at three or more of these component types, and the median time spent at each was about four minutes. Stops and time spent at other component types in Life Tech were considerably less. Thus, visitors selected to spend their time at a few exhibits rather than

⁴ The full report for the Visitor Survey will be submitted in April 2000.

sampling a large number of them. This bodes well for the exhibits at which visitors stopped because it means those exhibits were compelling enough to hold visitors' attention. As noted earlier, having more than one-quarter of visitors stop at more than half of the exhibits is not always the appropriate model for gauging the success or failure of an exhibition.

Visitation of Gallery Sections

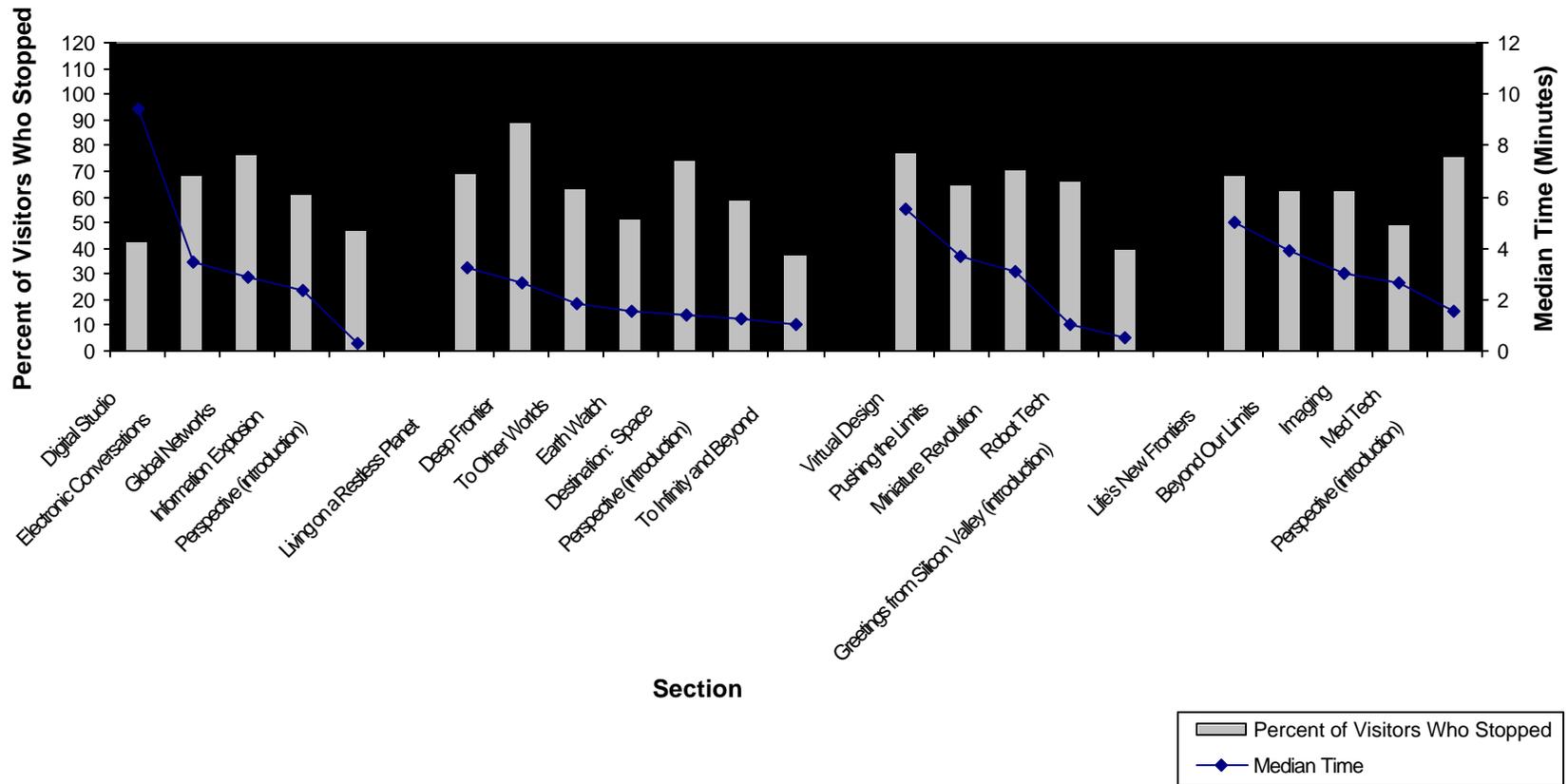
A second way to examine visitors' behaviors is to analyze the visitation to the different sections in each gallery (see Figure 3). Most of the sections were visited by at least half of visitors: all of the sections in Life Tech, all but one in Innovation and in Exploration, and all but two in Communication were visited by at least half of visitors. This suggests that the gallery sections contained a range of diverse components that worked together to attract a majority of visitors.

Because attraction power is sometimes a function of location, it is not surprising that Perspective in Life Tech and Global Networks in Communication—areas through which visitors enter the galleries—attracted the most visitors (see Figure 3). However, in Exploration where Deep Frontier attracted the most visitors, and Innovation where Virtual Design was the most popular section, location seems to be less of a factor. More visitors in Exploration stopped at Deep Frontier than at the introduction area—the area through which they entered the gallery. One hypothesis for the attraction power of Deep Frontier is its large and impressive ROV tank, which could have acted as an icon or beacon for that section. In Innovation, visitors also bypassed the introduction area in favor of the Virtual Design section. This is particularly noteworthy, as Virtual Design is located to the left of the entrance, and, in general, visitors turn to their right as they enter an exhibition (Melton, 1933). Virtual Design contains several large and popular exhibits (e.g., Cyberheads and the Tech Cyclone) which may account for its high attraction power.

The holding power of each gallery section also tells an interesting story. Unlike attraction power, holding power is independent of location. While the introduction areas had high attraction, they had low holding power. In fact, visitors spent less than one minute in the introduction areas to Communication and Innovation. Similarly, Digital Studio attracted the fewest number of visitors of all the sections in Communication, yet it held visitors for the longest amount of time (median time of over nine minutes).

Living on a Restless Planet (Exploration) and Life's New Frontiers (Life Tech) both had high holding power, but only one section had both the highest attraction power and holding power: Virtual Design in Innovation attracted the highest percentage of visitors and was also compelling enough to keep their attention for a median time of six minutes.

Figure 3.
Total Number of Stops and Time Spent in Each Gallery Section



Attraction Power and Holding Power of Component Types

Another way to examine visitors' behaviors is to analyze how they responded to different types of components. There are seven main types of components: computer interactives, mechanical interactives, simulation interactives, staffed exhibits, panels with artifacts, panels without artifacts, and ethics exhibits.

In all four galleries, more than half of visitors stopped at one or more of the mechanical interactives and one or more of the simulation interactives. In each of the galleries, except Exploration, more than half of visitors stopped at one or more of the computer interactives. As Table 1 shows, the popularity of mechanical interactives and computer interactives may be explained, in part, by the fact that they were plentiful. However, in Innovation, Communication, and Exploration, other exhibit components were more prevalent (e.g., panels without artifacts), but they were not stopped at as frequently as the interactive components, suggesting that interactives are popular for reasons other than sheer availability. For simulation interactives and staffed exhibits, this is certainly the case, as there were few available (between two and four) in each gallery and yet most visitors stopped at one or more of them.

The popularity of mechanical interactives, simulation interactives, staffed exhibits, and computer interactives is further substantiated by their holding power. As Table 2 shows, in each of the four galleries, visitors who stopped at mechanical interactives and simulation interactives spent a median time of more than two minutes. Computer interactives had an even higher holding power, as those who stopped at computer interactives in Communication, Innovation, and Life Tech spent three minutes or more. In fact, visitors who stopped at computers in Communication spent a median time of nine minutes. Even in Exploration, where computer interactives had low attraction power, the holding power was still high, as visitors spent a median of two minutes. In each of the galleries, except Communication, staffed exhibits also had high holding power with visitors spending a median time of between one minute and two minutes.

In addition to these general trends, there was one noteworthy, gallery-specific finding. In Innovation, panels with artifacts were the most popular type of component (visitors stopped at a median of two panels with artifacts). In addition, panels with artifacts had relatively high holding power (median time of one minute). The interview data provides insight to visitors' behaviors. As discussed later in this report, interviewees were fascinated to learn about how microchips are made, indicating that they spent time reading the panels with artifacts.

Table 1.
Total Number of Stops at Each Component Type by Gallery

Component Type	<i>Communication</i>			<i>Exploration</i>			Innovation			Life Tech		
	Number Available	% of Visitors Who Stopped	Median Number of Stops	Number Available	% of Visitors Who Stopped	Median Number of Stops	Number Available	% of Visitors Who Stopped	Median Number of Stops	Number Available	% of Visitors Who Stopped	Median Number of Stops
Computer	13	83.5	3.0	5	46.2	0.0	7	76.2	1.0	15	85.2	3.0
Mechanical	5	65.2	1.0	18	90.4	4.0	10	61.9	1.0	14	73.9	3.0
Simulation	3	52.2	1.0	4	69.2	1.0	2	52.4	1.0	2	53.0	1.0
Staffed	1	46.1	-----	4	77.9	1.0	2	57.1	1.0	2	23.5	0.0
Ethics	7	45.2	0.0	2	7.7	0.0	3	62.7	1.0	6	22.8	0.0
Panel with artifact	-----	-----	-----	8	49.0	0.0	7	62.7	1.5	2	28.7	0.0
Panel w/out artifact	6	21.7	0.0	21	51.9	1	8	34.1	0.0	8	29.6	0.0

Table 2.
Total Time Spent at Each Component Type by Gallery

Component Type	Communication		<i>Exploration</i>		Innovation		Life Tech	
	<i>n</i>	Median Time	<i>n</i>	Median Time	<i>n</i>	Median Time	<i>n</i>	Median Time
Computer	96	8 min. 36 sec.	48	1 min. 36 sec.	96	4 min. 47 sec.	98	3 min. 54 sec.
Mechanical	75	2 min. 20 sec.	94	2 min. 17 sec.	79	2 min. 20 sec.	85	3 min. 38 sec.
Simulation	60	1 min. 35 sec.	72	2 min. 24 sec.	66	2 min. 6 sec.	61	2 min. 15 sec.
Staffed	53	-----	81	2 min. 8 sec.	72	1 min. 57 sec.	27	1 min. 16 sec.
Ethics	52	1 min. 1 sec.	8	39 sec.	79	47 sec.	26	28 sec.
Panel with artifact	-----	-----	50	27 sec.	79	1 min. 20 sec.	33	42 sec.
Panel w/out artifact	25	33 sec.	34	50 sec.	43	12 sec.	34	37 sec.

CONVEYANCE OF THE MAIN MESSAGE

One way to gauge visitor understanding of exhibition content is to talk with them after their visit. The gallery interviews offer insight into what visitors learned and experienced. Visitors' descriptions of their learning in the Communication and Exploration were somewhat vague. That is, visitors did not necessarily identify specific ideas that they learned, rather they spoke about being exposed to and interacting with new technologies, and in some cases, experiencing a new phenomenon such as an earthquake. Additionally, seeing what is not normally visible to the naked eye proved to be an exciting part of visitors' learning experiences.

In Life Tech and Innovation, however, visitors had a different kind of learning experience. In Life Tech, visitors recalled specific facts that they had gleaned from some of the exhibits, likely because those facts were about health and the human body, a relevant topic for all visitors. Just like visitors to Exploration and Communication liked being able to see the inside of technological machines, and visitors to Life Tech liked being able to see parts of the human body that are usually hidden from view. In Innovation, the Clean Room and workbenches affected visitors' learning experiences. For example, visitors were very excited to learn about chip development and enjoyed seeing the Clean Room. Others liked the educational experiences that the workbenches offered. While visitors could not actually identify what they had learned from the workbenches, they felt like they were involved in the learning process.

While visitors' learning experiences were broad-based, the objectives for each gallery, as stated in each gallery's Exhibition Plan (see page 4 of each gallery report), are content-based. Typically, museum practitioners think about conveying particular ideas and information when they set out to develop an exhibition. In the best of all possible worlds, exhibitions are then executed with the intention of presenting the ideas that practitioners initially said they wanted to communicate. Many seasoned evaluators and practitioners advocate developing exhibitions that have one broad idea, and they recommend that all the exhibits within the exhibition relate back to the primary idea. So, ultimately, the specific objectives need to be cohesive and the individual exhibits need to reflect those objectives. This study was not conducted to critique the galleries' objectives, so this discussion will examine larger issues of what exhibitions should embody if visitors are to grasp essential exhibition ideas. In addition to exhibitions presenting solid, communicable exhibits, if visitors are to grasp the concepts and conceptual framework of an exhibition, exhibitions need to provide an introduction or orientation to the exhibition.

Gallery Introduction

The observation instrument and interview guide included items that would indicate visitor behavior and experience at the introduction areas. Observations show that at least half of visitors stopped in the introduction areas of each gallery. This finding is not surprising considering that introduction areas are located at the entrance of the galleries, which increases their attraction power. Holding power, however, is not a function of location, and visitors spent very little time in the introduction areas. Visitors spent a median time of about one minute in the introduction areas of Exploration and Life Tech and less than one minute in those of Innovation and Communication. Furthermore, it should be noted that in each gallery, visitors spent the least amount of time in the introduction area as compared to all other sections (see Figure 3). This is noteworthy, as other studies have shown that visitors spend more time at exhibits in the

beginning of their visit and, as fatigue sets in, less time at exhibits near the end of their visit (Falk, et. al., 1985). Thus, the relatively short amount of time visitors spent in the introduction areas suggests that these areas were not particularly compelling.

During the interviews, visitors were asked if they experienced an area that served as an introduction. Roughly half correctly identified Explorers' Hands in Exploration, and Postcards from the Edge in Innovation as introduction areas. Only one visitor of twenty identified the Communication Gallery introduction and two visitor groups out of twenty identified parts of the Life Tech introduction. It makes sense that Explorers' Hands was identified as the introduction by the most visitors, as compared to other introductions, because Exploration is the only gallery that provides a separate physical space to house the introduction and also uses interpretive text to present the main idea of the gallery. Furthermore, some visitors went on to say that they thought Explorers' Hands worked well as an introduction because it provided a lens through which to view the exhibition—which is exactly what an introduction should do for visitors.

Another way to gauge the successes and shortcomings of introduction areas is to examine how visitors articulated the theme of the individual galleries. There is the assumption that introductions, which are sometimes called advanced organizers, provide the physical and conceptual framework of the exhibition and introduce the themes of the exhibition. It is believed that proper introductions can create more comfortable and understandable exhibitions (Griggs, 1983). In Exploration, for example, almost all visitors named the three primary exploration areas—land, ocean, and space, with about half seeing exploration itself as the unifying theme for land, ocean, and space, and a few seeing the main idea as displaying new information and technology. In contrast, almost half of visitors to Life Tech experienced the gallery to be about health and the human body, with a lesser number of visitors making the connection between technology and studying the human body. Similarly, visitors to Communication only gleaned the surface of the content, saying that the gallery was about communication devices. That is, visitors to Communication were experiencing the components at face value, without seeing larger ideas behind the components, whereas in Exploration, visitors experienced the individual components within the larger theme, perhaps because visitors were cued in to what the larger theme was. There was little agreement among visitors about the primary theme of the Innovation Gallery. For example, the Clean Room had such a strong effect on some visitors that they thought the gallery was about chip development. For a few others, the gallery was about the latest technological advancements, and some visitors could not identify a theme.

If there are primary messages that museum staff members believe are important for visitors to glean, or if there is a conceptual framework around which content is presented, staff need to make sure that visitors are made aware of these messages and the framework. An introduction to an exhibition is the most logical place in which to place these kinds of ideas. Visitors often have a difficult task when visiting a museum. They are drawn to exhibits because they want to experience them. However, when visitors lack a depth of understanding about a subject—like so many visitors do—and there is nothing in the exhibition to direct them to think about their experience in a particular way, their experience will not likely meet staff members' expectations.

If there is a specific conceptual framework that is meant to hold the exhibition together, the individual exhibits throughout the exhibition should reinforce that framework. The workings of

individual exhibits, how they connect to the larger theme, and how they convey ideas, are other issues that deserve examination.

Immersion Exhibits

All four galleries include one immersion exhibit. Staff wanted to know if visitors knew that they were in an immersion environment, and if so, what elements need to be in place for visitors to experience an exhibit as immersive, and whether these immersion environments were effective at conveying content. Data from the interviews provide concrete information related to these questions.

Almost half of visitors who were interviewed after visiting the Innovation Gallery did not enter the Clean Room, but of those who did, nearly all identified the Clean Room as the immersion environment. Visitors who knew something about clean rooms felt that it was authentic, from the floor, to the bright lights, to measuring the amount of dust on one's body. Without question, the Clean Room was a convincing environment to those who went in it; although, as one visitor noted, for it to really feel authentic, visitors should be able to see people working in the space. The observation data show that 54 percent of visitors entered the Clean Room, but 90 percent of those visitors entered it through the exit. While entering the Clean Room as intended is desirable, visitors' backward path through the Clean Room did not seem to diminish the quality of their experience. Many interviewees still spoke about the Clean Room as an educational experience, saying they learned about chip development and silicon.

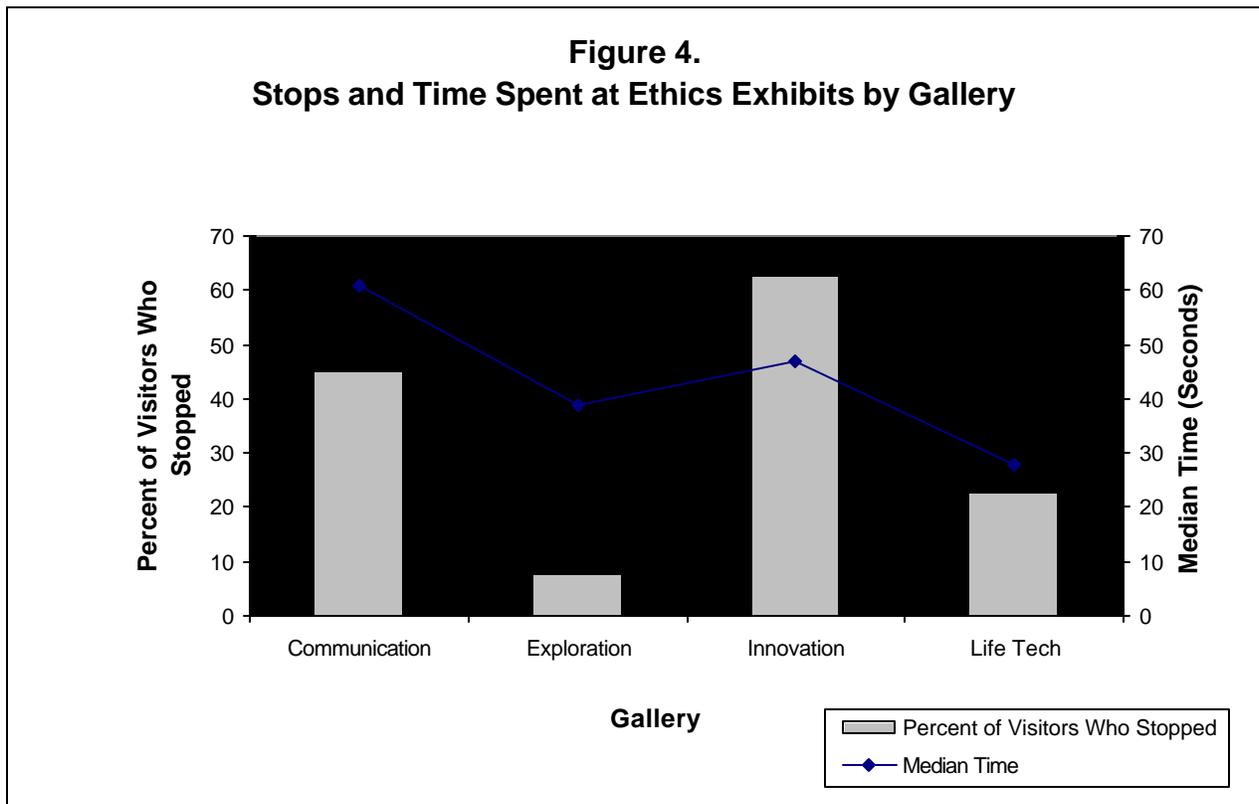
The Operation Theater fared nearly as well as did the Clean Room in terms of visitors identifying it as an immersion environment, but it was less successful at providing visitors with a content-rich experience. One-quarter of interviewees never walked into the Operation Theater, and 11 of the 15 remaining interviewees identified the Operation Theater as the real-world environment. Visitors offered many, many suggestions for enhancing their experience. The vinyl flooring and the dummy on the gurney were convincing, but almost half of interviewees noted that there should be real machines displayed instead of photographs of machines, a brightly lit room with green or white walls, and double-swinging doors for visitors to walk through.

Only one interviewee each thought the Planetary Base and Chat Connection electronic café were immersion environments.

Clearly, visitors value authenticity, and they seem to be able to recognize when something is authentic. The Clean Room was easily discernable as a real clean room, and the other environments were unconvincing fabrications. In other studies conducted by RK&A, visitors have strongly indicated the importance of authenticity, not only in environments that are intended to represent something specific, but in the information that is conveyed to them (RK&A, 1994, 1996). Planetary Base and Chat Connection did not look enough like the environments they were meant to be. Visitors said they looked too much like exhibit environments. Having interpretive materials interrupt authenticity is likely acceptable, as in the Clean Room, but interrupting a real-world environment with exhibit cases, as in Planetary Base, disrupts the authentic environment too much. Whatever else happens in a Planetary Base should be replicated for visitors to see, and it should be authentic and true to form.

Ethics Exhibits

All four galleries include two or more ethics exhibits. Life Tech and Communication have six and seven, respectively, and Exploration and Innovation have two and three, respectively. Behavioral data are revealing: the ethics exhibit in Innovation, Innovation Forum, attracted the highest percentage of visitors, with 63 percent of visitors stopping at one or more of the exhibits for a median time of 47 seconds (see Figure 4). Communication includes seven ethics exhibits and 45 percent of visitors stopped at between one and three of them. Compared to the ethics exhibits in the other three galleries, the ethics exhibits in Communication had the highest holding power with visitors spending a median of 1 minute at the text panels. Life Tech has six ethics exhibits. Twenty-three percent of visitors stopped at between one and three of them. Among the four galleries, the ethics exhibits in Life Tech had the lowest holding power, with a median of 28 seconds. Exploration has two ethics exhibits. Attraction power at these two exhibits, compared to the other galleries, was the lowest, with 8 percent of visitors stopping at them. The median time spent at the two ethics exhibits was 39 seconds.



Exhibits that are about ethical and social issues, it seems, would naturally catch people's attention, and cause them to pause, reflect, and think about the ideas because the notion of museums including exhibits that present multiple perspectives of a controversial idea is not a particularly mainstream idea. The surprise of encountering such an exhibit, in and of itself, is a potential attraction feature for some visitors, as was articulated by a few interviewees. In fact, most interviewees noted that ethics exhibits raise important issues and were in favor of the Museum displaying them. When ethics exhibits do not capture people's attention, one could hypothesize that the location and placement of the exhibit is not advantageous, or that the design of the exhibit—not just the way the exhibit looks, but the component type as well—is not eye-catching. For example, in Innovation, the top-performing ethics exhibits were both computers. They attracted 29 percent of visitors compared to the top-performing ethics exhibits in Communication, which attracted 18 percent and 13 percent of visitors. Both components in Communication were panels with an artifact, and one also included a mechanical component.

In terms of holding power, the top performing ethics exhibits in Communication did relatively well: Privacy: Take Control held visitors for a median of 44 seconds and Telephone: Take Control held visitors for a median of 40 seconds. Interestingly, visitors to Communication, when asked about the ethics exhibits, noted that they did not learn anything new. Perhaps they spent time reading the panels simply to confirm what they already knew. The interviews (and preliminary findings from the visitor survey) indicated that even though visitors did not regard the information as new, they did think it was relevant.

Usually when visitors do not spend time contemplating the issues, one can hypothesize that the content may not reveal new ideas to visitors or that they fail to see the relevance in their own lives. Fortunately, two of the ethics exhibits, Beginnings and Endings in Life Tech and Who's Talking? Who's Listening? in Communication, were studied in-depth using a data collection strategy called focused observation and interviews. These data offer insight into how the public responds to these kinds of exhibits and how to improve visitors' experiences with them.

Beginnings and Endings had relatively low attraction and holding power. Focused observations and interviews reveal that visitors who did stop to read the panels—as they were asked to do in the focused observation and interviews—recognized the difficult issues presented in the panels and praised the interpretive strategy of presenting these issues through stories about people's different experiences. Interviewees said reading about other points of view encouraged them to explore their own point of view, and in some cases, discuss it with their children.

When an exhibit fosters the intended kind of social interaction (e.g., visitors talking about the ideas presented in the exhibit), there is cause for celebration. Museums are known as places that can foster social interaction, but sometimes the social interactions that are observed are not exhibit- or content-related. Clearly, the content in Beginnings and Endings caused visitors to pause and think about what they would do in a similar situation. The scenarios in Beginnings and Endings may not have been relevant to most visitors, but visitors were still able to imagine being one of those people and think about what they might do. The content of Beginnings and Endings was compelling for those visitors who decided to read the panels in their entirety. Who's Talking? Whose Listening? did not have the same kind of power. Of course privacy issues regarding the Internet are not life and death issues, but nearly all interviewees noted that

there was something personally relevant to them in *Who's Talking? Who's Listening?* Though relevant, except for a few interviewees, content on these panels in *Communication* was not new. Personal relevance is important for exhibit developers to consider, but the content is also important, as it must bring visitors to a new place. *Beginnings and Endings* challenged some visitors, but others thought the presentation was too simplistic, noting that the content deserved more in-depth treatment.

The Tech Museum wanted to know if visitors thought the presentation of ethical issues was balanced. Some visitors, when exposed to content that is controversial, will look for their particular point of view. If they do not see it, they will note that the presentation is not balanced. A few visitors to each *Beginnings and Endings* and *Who's Talking? Who's Listening?* thought the presentation was not balanced. Visitors to *Beginnings and Endings* wanted to see the conservative viewpoint expressed, for example, and visitors to *Who's Talking? Who's Listening?* wanted to see a viewpoint that favored freedom of speech.

Design issues vis-à-vis the ethics panels were also explored. In both galleries, visitors did not necessarily praise the visual appeal of the ethics panels. The exclamation point and peephole in *Who's Talking? Who's Listening?* were largely overlooked and misunderstood, and the photos and speech bubbles on *Beginnings and Endings* seemed inappropriate, considering the serious content. Even the open space in which *Beginnings and Endings* were placed was awkward. The design of the panels, as well as their placement, affected visitor behavior. Additionally, in both galleries, visitors noted that the ethics exhibits lacked hands-on options, which would act as attention-grabbers for children. Inviting children to learn about these issues was of more concern to visitors at *Who's Talking? Who's Listening?*

In summary, staff needs to think about aligning content with audience and content with design—how the exhibit looks, where it is placed, and the selected medium. For example, if the issue is relevant to children's lives, then a hands-on component should be present to attract children. If the issue is more relevant to adults, text is likely a suitable presentation method. If the issue is one that is for adults but can be discussed with children, perhaps The Tech Museum can provide guidance to parents about how to best approach the topic with their children. If the issue is a private matter, present the exhibit in a private space so visitors feel comfortable either using the exhibit or discussing the content with their family.

OVERALL GALLERY FUNCTIONING

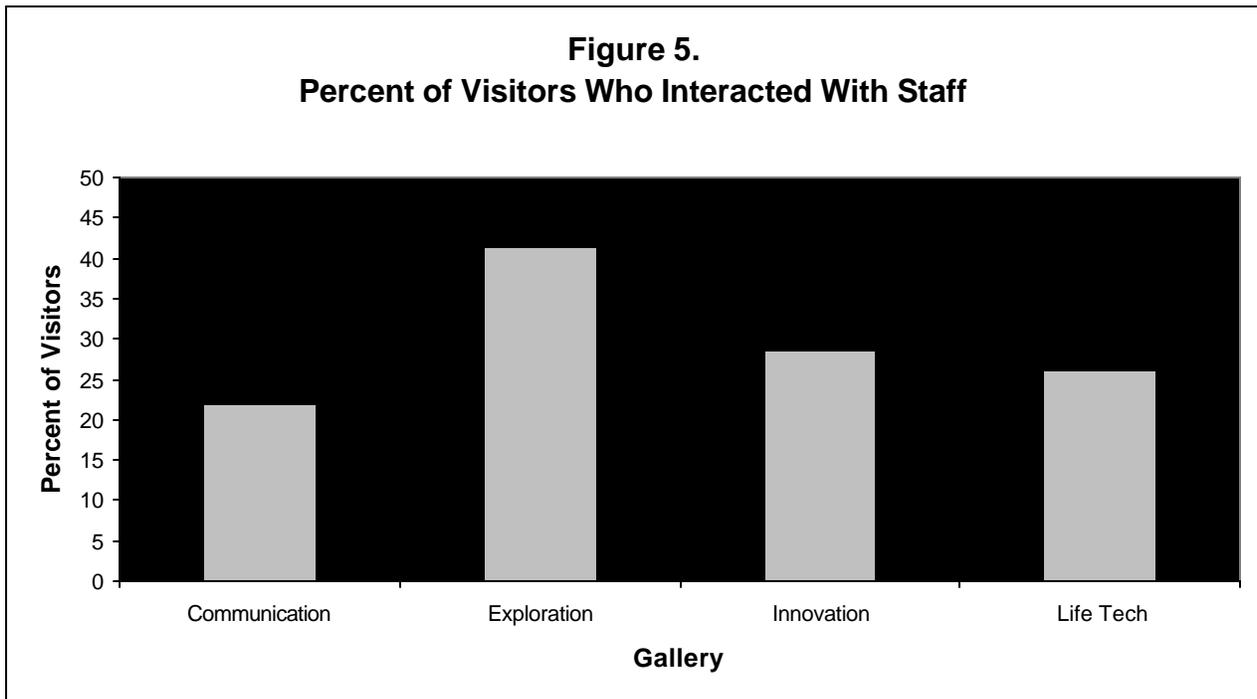
Tech Museum staff raised several concerns about the functioning of the galleries: the role staff play in visitors' experiences, the number of broken exhibits encountered by visitors, the frequency at which visitors waited to use components, and use of the Spanish-language option at computer interactives and videos.

Staff

Visitors utilize and appreciate staff in the galleries. The timing and tracking observations showed that about one-third of visitors talked directly with a staff person at least once in each of the galleries (see Figure 5). Preliminary data from the visitor survey indicate that two-thirds of

Visitors talked with or received assistance from a staff member at least once while in all the galleries. These findings corroborate with the tracking data in that most visitors reported visiting more than one gallery. Interestingly, the visitor survey indicated that visitors would prefer more staff in the galleries: they rated the availability of staff a mean of 4.89 on a scale of 1 (poor) to 7 (excellent). In addition, when asked to describe their experiences in the galleries, some visitors chose, “I would like for more staff to be available to help me use the exhibits.”

In addition to making use of staff in the galleries, visitors were pleased with their interactions with staff. Survey respondents rated staff courtesy a mean of 6.04 on a scale of 1 (poor) to 7 (excellent). Furthermore, as noted earlier in this discussion, staffed exhibits (e.g., Curiosity Counters, Jet Pack, Damaged Building Set) were among the top exhibits for attraction power and holding power. In fact the Tech Museum findings are similar to other studies conducted by RK&A that have indicated visitors to science museum highly value staffed demonstrations (Korn, 1995).



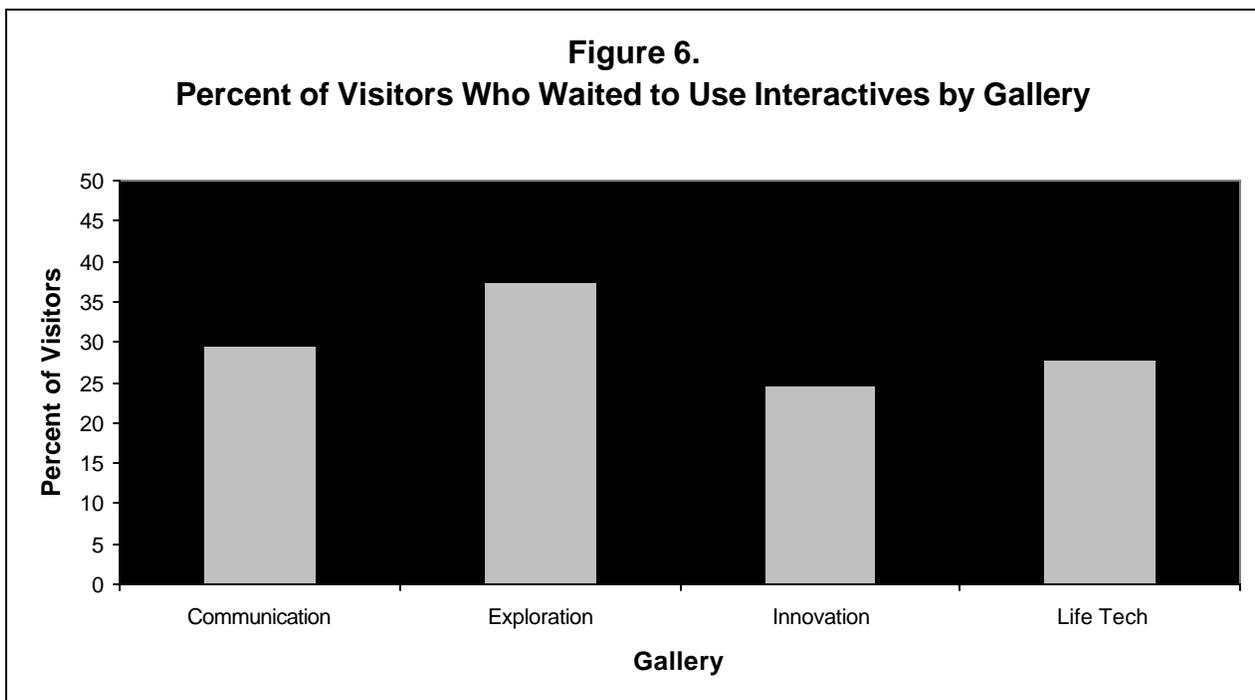
Broken Exhibits

During the study, each gallery contained between one and eight broken exhibits. Considering the total number of components available, this is not a high percentage. However, because visitors only stop at a few components (median of 7 to 11 in each gallery), encountering even one broken exhibit could affect their experience. In fact, it is not the incidence rate of broken exhibits that is important, but rather visitor perception of the number of broken exhibits in the galleries.

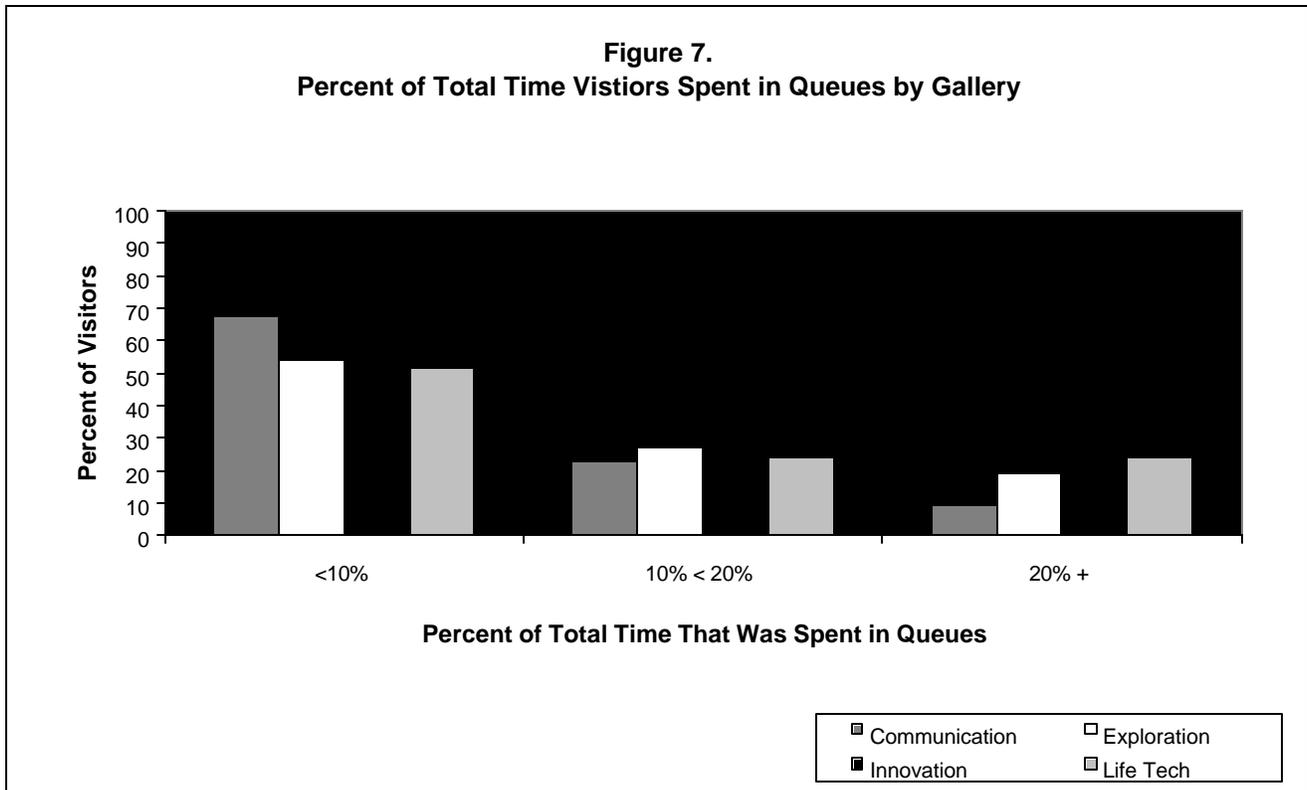
According to preliminary visitor survey findings, a sizeable number of visitors were negatively affected by the presence of broken exhibits in the galleries. When asked to choose statements that reflected their experiences with the exhibits, one-quarter of visitors chose, “I was disappointed because there were broken exhibits.” In addition, visitors rated the overall maintenance of the exhibits a mean rating of 5.22 on a scale of 1 (poor) to 7 (excellent). While this rating is on the higher end of the scale, it suggests some dissatisfaction with exhibit maintenance. Of the three-quarters of visitors who reported encountering broken exhibits, about two-fifths were bothered by them and selected potential solutions: increase the admission fee (15 percent), reduce the number of unique exhibits and add more duplicate exhibits (15 percent), and reduce the number of hands-on exhibits (11 percent).

Waiting to Use Exhibits

Overall, timing and tracking observations showed that visitors waited at few components and spent little of their total time waiting in lines. As shown in Figure 6, about one-third of visitors waited to use components in each of the galleries



In terms of time, most visitors who waited in designated lines (queues) spent 10 percent or less of their total time in these lines.



Despite the low frequency of waiting that the trackings showed, it is, again, the visitor’s perception that matters (i.e., whether they feel as though they waited at a lot of components). According to preliminary visitor survey findings, a significant number of visitors indicated that waiting to use components negatively affected their experiences in the galleries. Nearly half of visitors thought the lines at certain exhibits were too long and chose not to wait in some of them. While one-quarter indicated that they did not mind waiting in lines because the exhibits were unique, others said they would prefer shorter lines even if that means having fewer unique exhibits. Only a few visitors said they were disappointed because they came to the Museum to see a specific exhibit and it was always in use.

Use of Spanish Language Option

Instructions and content were available in Spanish at between 5 and 13 computer interactives and videos in each gallery. Five visitors selected Spanish a total of seven times at 2 videos and 1 computer interactive in Innovation. Four visitors used the Spanish language option at 3 computer interactives in Communication. One visitor in Exploration opted for Spanish at 1 video. No visitors selected a Spanish language option in Life Tech.

Staff may be disheartened to see such low use of Spanish. The tracking data must be examined in the context of the current visitor composition. Preliminary findings from the visitor survey show that 12 percent of visitors to the Tech Museum speak Spanish, and of those less than half selected Spanish at components at which it was offered. These statistics speak to the need for development of a larger Spanish-speaking audience by the Museum. Staff should be commended for taking the first step: placing the infrastructure within the Museum to meet the needs of Spanish speakers. The second would be to cultivate a Spanish-speaking museum audience.

RECOMMENDATIONS

- Carefully craft visitor behavior objectives against which observed visitor behaviors can be measured.
- As new exhibits are developed, maintain the diversity of exhibit component types in each area to balance the attraction power of each area. In particular, staffed exhibits, simulation interactives, and computers are popular component types. The placement of these components needs to be carefully considered.
- In general, panels without artifacts did not attract or hold visitors. Consider alternative options, such as: using panels sparingly; reworking panels to include artifacts or simple interactives; or embedding panel messages in existing computer interactives—where visitors spent most of their time.
- Visitors liked the ethics exhibits. To increase their attraction power, consider incorporating interactive elements and using other media in addition to printed text.
- When conceptualizing the ethics exhibits, let the content guide the ultimate design of the component. For example, highly personal subjects should be presented in a private space, and subjects that are meant to promote family discussions should be presented in a more social space. If children are part of the target audience, integrate an interactive component into the exhibit. (Refer to the detailed component recommendations for *Beginnings and Endings* and *Who's Talking? Who's Listening?* in the Life Tech report and *Communication* report, respectively.)
- Because visitors stop at few components during the course of a gallery visit, make a gallery's main ideas and themes available and obvious in each component.

- Conduct remedial evaluation on all computer and mechanical interactives to ensure operational functioning and visitor learning. Follow the model used to evaluate Who's Talking? Who's Listening?, Beginnings and Endings, Shake Lab, and Innovation workbenches. (Refer to the detailed component recommendations for the Shake Lab and Innovation workbenches in the Exploration report and Innovation report.)
- In Communication and Innovation, delineate a distinct space to serve as an introduction area. In each introduction, provide a concrete overview of the gallery and inform visitors of the physical layout and main themes of each gallery section. Visitors are very literal, so themes need to be obvious and repeated throughout the introduction and gallery. Using interactive components in the introduction area will increase attraction power and holding power, but they must be tested to ensure that they communicate the intended themes to visitors.
- The video introduction area and the Transformations photo booth in Life Tech had high attraction among visitors. However, visitors did not experience them as introduction areas, nor did they realize the gallery's themes. Consider adding captioning to the videos to explain how the images are connected to the gallery's themes. The Transformations photo booth is an enclosed area. Therefore, consider adding an audio component to help visitors understand the connection between what they are witnessing in the photo booth and the gallery's theme.
- Visitors can sense and appreciate authenticity. Recreate all the details of an environment to transport visitors to a real place. For example, the Clean Room was extremely successful at conveying a clean room, from the details of the lighting, to the flooring, to the actual artifacts. Med Tech, on the other hand, would have felt more like an operation theater if real machines were displayed, if there had been an entry/exit experience, and if the lighting of the space was significantly different from the rest of the gallery.
- Evaluate the galleries programmatic aspects for content. For example, activities at the Curiosity Counter, where visitors ask questions of staff, provide opportunities for visitor learning. Train staff to convey succinct and accurate gallery messages to reinforce gallery objectives.
- Increase the number of staffed exhibits. Since visitors like interacting with staff, staffed exhibits are a perfect opportunity for conveying content. For example, in Damaged Building Set, staff operating the exhibit has time to explain which earthquake is going to be simulated, how the movement compares to a real earthquake, and what the Richter-scale measurement means.
- Keep popular exhibits and exhibits near the entrance areas operational. They receive the most use and represent primary experiences for visitors.
- To encourage higher use of the workbenches and other technical-looking mechanical interactives, consider placing additional gallery staff to attract and provide assistance to visitors.

REFERENCES

- Falk, J.H., Koran, J.J., Dierking, L.D., and Dreblow, L. (1985) "Predicting Visitor Behavior," *Curator*, 28 (1985): 249-257.
- Griggs, Stephen. (1983) "Orienting Visitors within a Thematic Display," *International Journal of Museum Management and Curatorship* 2 (1983): 386-393.
- Randi Korn & Associates, Inc. (1992) "Treasures from the Sand: An Evaluation," unpublished manuscript. Colonial Michilimackinac, Mackinaw City, MI.
- _____ (1993) "The Living World: An Evaluation," unpublished manuscript. The Saint Louis Zoo, Saint Louis, MO.
- _____ (1994) "An Evaluation of the *Becoming Americans* Theme," unpublished manuscript. Colonial Williamsburg Foundation, Williamsburg, VA.
- _____ (1995) An analysis of differences between visitors at natural history museums and science centers,) *Curator* 38 (3): 150-160.
- _____ (1997) "*Electric Space: A Summative Evaluation*," unpublished manuscript. Space Science Institute, Boulder, CO.
- Melton, A. (1933) Some behavior characteristics of museum visitors, *Psychological Bulletin*, 30, 720-721.
- Serrell, B. (1997). Paying attention: the duration and allocation of visitors' # time in museum exhibitions. *Curator*, 40 (2), 108-125.

EXECUTIVE SUMMARY: COMMUNICATION GALLERY

I. TIMING AND TRACKING OBSERVATIONS

The Communication Gallery contains 42 components (self-contained exhibits for visitors to use or read), an additional 10 environmental features for visitors to notice, 1 barcode distributor, 2 sets of laser printers, and 3 designated lines (queues) in which visitors could wait for an interactive.¹

Conditions of the Gallery During the Study

A total of 115 timing and tracking observations of visitors in the Communication Gallery were conducted in July and August 1999.

- The majority of the trackings in the Communication Gallery (87 percent) were conducted during moderate visitation conditions.
- Visitors stopped at between zero and four broken exhibits while in the Communication Gallery. The median number of broken exhibits stopped at was zero.

Visitor Characteristics

In total, 22 children (ages 9 to 15 years) and 93 adults (16 years and older) were unobtrusively observed in the Communication Gallery.

Overall Visitor Patterns in the Gallery

Total Number of Components Stopped At per Visitor²

- Visitors stopped at between 1 and 38 different components of the 42 available. The median number of components stopped at was seven (i.e., 17 percent of the gallery).
- Four-fifths of visitors (81 percent) stopped at between 1 and 15 components (i.e., 2 percent to 36 percent of the gallery).

Total Time (in Minutes) Spent in Exhibition

- The shortest amount of time spent in the exhibition was 20 seconds, and the longest was 1 hour 39 minutes. The median amount of time spent was 14 minutes.

¹ Museum documentation (“Exhibit Operation and Performance Descriptions” and “Exhibit and Program Outline - Concept 3”) was used to identify and name the items (components, environmental features, etc.) listed on the timing and tracking form.

² For the purposes of this study, a “stop” was defined as a visitor standing for three seconds or longer in front of a given component. If a visitor returned to a component at which she or he had previously stopped, this return was not counted as an additional stop, but the amount of time spent was included in the total time spent at the component.

- About half of visitors (55 percent) spent between 1 and 15 minutes in the gallery.

Visitor Path

- Overall, there is very little pattern in the way visitors moved from component to component, which indicates visitors did not follow one particular path through the gallery but rather were attracted to individual components according to their own interest and agendas.
- Each of the gallery sections was visited by at least two-fifths of visitors, with the most stopping in Global Networks and the least in Perspectives. Visitors spent the most amount of time in Digital Studio and the least in Perspectives.

Visitation to Individual Components

Stops at Individual Components

- The components at which the most visitors stopped were the Chat Connection electronic café and the Curiosity Counter, followed by the Cyber Screen computer interactive.
- All of the least visited components were panels: Digital Studio Network (with artifact), Find It Fast, What Is the Internet?, Global Networks introduction, and Online Teams.

Time Spent at Individual Components

- The component at which visitors spent the most time was the Chat Connection electronic café, followed by the Sound manipulation computer interactive, and the Video Editing computer interactive.
- Visitors spent the least amount of time at the following components: the Antennae Network labeled environmental feature, the Digital Studio introduction panel with videos, and the Global Networks introduction panel.

*Comparison of Component Types*³

Comparison of Total Number of Stops

- Visitors stopped at a median of three computer interactives, one mechanical interactive, and one simulation interactive. Visitors noticed a median of two environmental features.⁴
- More than half of visitors did not stop at any ethics exhibits, panels without artifacts, or environmental features.

³ For the purpose of this analysis, the components of the Communication Gallery were classified as the following five main categories: interactive components (computer, mechanical, simulation, and staffed), videos, text and graphics panels (those with and without artifacts), environmental features (labeled and unlabeled features), and ethics exhibits (interactives, videos, or panels dealing with ethical issues). Several components were classified as more than one type.

⁴ When visitors attended to an environmental feature for less than three seconds, this was recorded as a “notice.” When visitors attended to an environmental features for more than three seconds, this was recorded as a “stop.”

- Three statistically significant relationships were found: visitors without children stopped at more panels without artifacts and environmental features than visitors with children, and males stopped at more mechanical interactives than females.

Comparison of Total Time

- Visitors spent the most amount of time at computer interactives, followed by mechanical interactives, simulation interactives, and ethics exhibits.
- Visitors spent less than one minute at panels without artifacts and environmental features.
- One statistically significant relationships was found: visitors without children spent more time at environmental features than visitors with children.

Behaviors at Interactive Components

Four behaviors at interactive components were noted during the timing and tracking observations: using interactives (i.e., physically manipulating the interactive as designers intended), waiting for interactives, selecting the Spanish-language option on computer and video components, and interacting with Museum staff.⁵

Use of Interactive Elements

Visitors used between 0 and 16 interactive elements out of 29 available. The median number of interactive elements used was three.

- Of the ten interactives that were used by at least 50 percent of the visitors who stopped, five were computers, three were mechanical interactives, one was a simulation interactive, and one was a staffed exhibit.
- The Get Connected Internet demonstration area was used by the fewest number of visitors.

Data collectors also noted which interactives visitors tried to use but were unable to operate. Out of a total of 29 interactive elements, 12 proved difficult to operate for at least one visitor.

- Half of the visitors who tried to use the Electric Messages mechanical interactive were unable to operate it (54 percent).
- About one-fifth of those who tried to use the TV Truck Live simulation interactive and the Animation Playback computer were unable to operate them (both 18 percent).

⁵ When visitors stopped at panels, it was assumed that they read at least some of the text. However, when visitors stopped at interactive components they behaved in a number of ways (e.g., operating the component, watching others use the component, reading the associated text, etc.). As such, only purely observable behaviors were selected for the tracking study.

Waiting at Interactive Elements

Visitors waited to use 13 of the 29 interactive elements available. Three of the interactives had designated queues, while the other 10 did not.

- Visitors waited at between zero and five interactives. Nearly three-quarters of visitors (70 percent) did not wait at any interactives.
- Of the 31 visitors who waited in queues, two-fifths (42 percent) spent 5 percent or less of their total time waiting in these designated lines. One-quarter (26 percent) spent between 5 and 10 percent of their total time waiting in queues.

Selection of Spanish-Language Option

The Communication Gallery had 13 components at which visitors could select a Spanish version of the video or computer program. Visitors selected Spanish at three of the 13 components that offered this option.

- There were only four instances of Spanish being selected (one visitor selected Spanish twice and two other visitors selected Spanish once) out of the 115 trackings conducted.

Staff Interactions

The number of times visitors interacted with staff was recorded during the timing and tracking observations. Visitors could interact with gallery staff at one component (the Curiosity Counter) as well as with staff stationed throughout the Communication Gallery. A staff interaction constituted the observed visitor talking directly to staff.

- Visitors interacted with staff between zero and nine times while in the gallery.
- More than three-quarters of visitors (78 percent) did not interact with any Museum staff.

II. INTERVIEWS

Open-ended interviews were conducted with visitors immediately after their visit to the Communication Gallery to gather their perceptions and opinions of the exhibition. Twenty interviews were conducted with 31 people—19 females and 12 males. Their average age was 36 years.

Gallery Content

Most visitors responded that the main idea of the gallery was communication, different forms of communication, or one or more particular forms of communication. When asked about the subtopics that support the main idea, most visitors named a few subdivisions they saw in the gallery, but there was no overall pattern to their responses.

Gallery Environment

Visitors generally knew when they were entering a new section of the gallery. Visitors mentioned a variety of design features that signaled section separations to them, such as wall barriers, signs, wall and floor colorings, lighting, and the general layout of exhibit components.

When asked about the décor of the gallery, some visitors mentioned the “high tech” design, the bright colors, or the lighting. Some visitors did not notice the overall décor of the gallery, even when asked specifically about the lighting, flooring, and other environmental features. A few visitors had negative comments about the décor, stating that it was not welcoming or that it was too overwhelming.

Chat Connection Electronic Café

Almost none of the visitors interviewed recognized Chat Connection as an immersion environment. Visitors had many suggestions on how to make this area seem more like a real place, including adding brighter, more natural lighting.

Other Aspects of the Gallery Environment

Visitors also mentioned other aspects of the gallery environment that hindered their experience. Primarily, some visitors experienced confusion in navigating their way through the gallery.

Individual Components

Introductory Area

Over half of all visitors did not notice any introductory area in the Communication Gallery. Some visitors thought the Curiosity Counter, located to the left of the entrance, acted as an introduction by showcasing the progress in communication technology over time. A few visitors thought Uses of Fiber-Optic Cable, located to the right of the entrance, was the introduction.

Ethics Exhibits

Most of the visitors visited one or more of the ethics exhibits in the Communication Gallery. Visitors’ responses to these exhibits were positive: they thought the exhibits raised important issues, and a few commented that having these issues raised in The Tech Museum was a good idea.

Visitor Learning

Visitors’ learning experiences in the Communication Gallery covered a wide range. Visitors described learning about communication technology, technological advancements, issues surrounding communication technology, and learning through interacting with communication technology itself. Some visitors, although they enjoyed their experience in the gallery, felt the information was familiar to them and said they did not learn anything new.

EXECUTIVE SUMMARY: EXPLORATION GALLERY

I. TIMING AND TRACKING OBSERVATIONS

The Exploration Gallery contains 75 components (self-contained exhibits for visitors to use or read), an additional 24 environmental features for visitors to notice, 3 designated lines (queues) in which visitors could wait for an interactive, and 1 theater.¹

Conditions of the Gallery During the Study

A total of 104 timing and tracking observations of the Exploration Gallery were conducted in July and August 1999.

- Nearly all of the trackings in the Exploration Gallery (89 percent) were conducted during moderate visitation conditions.
- Visitors stopped at between zero and five broken exhibits while in the Exploration Gallery. The median number of broken exhibits stopped at was one.

Visitor Characteristics

In total, 23 children (ages 9 to 15 years) and 81 adults (16 years and older) were unobtrusively observed in the Exploration Gallery.

Overall Visitor Patterns in the Gallery

Total Number of Components Stopped At per Visitor²

- Visitors stopped at between 1 and 32 components of the 75 available. The median number of components stopped at was 10 (i.e., 13 percent of the gallery).
- Three-quarters of visitors (75 percent) stopped at between 1 and 15 components (i.e., 1 percent to 20 percent of the gallery).

Total Time (in Minutes) Spent in Exhibition

- The shortest amount of time spent in the exhibition was 1 minute 56 seconds, and the longest was 1 hour 6 minutes. The median amount of time spent was 15 minutes.
- Two-thirds of visitors (68 percent) spent between 5 and 25 minutes in the gallery.

¹ Museum documentation (“Exhibit Operation and Performance Descriptions” and “Exhibition Plan 10/2/98”) was used to identify and name the items (components, environmental features, etc.) listed on the timing and tracking form.

² For the purposes of this study, a “stop” was defined as a visitor standing for three seconds or longer in front of a given component. If a visitor returned to a component at which she or he had previously stopped, this return was not counted as an additional stop, but the amount of time spent was included in the total time spent at the component.

Visitor Path

A third way to understand the overall visitor experience is to describe the path visitors took through the Exploration Gallery. Data collectors noted the first five stops visitors made in the gallery and whether they stopped in the Planetary Base area.

- Overall, there was very little pattern in the way visitors moved from component to component: the frequencies are low for all of the other stops. This finding indicates that once visitors entered the Exploration Gallery they did not follow one particular path through the gallery, but rather were attracted to individual components according to their own interests and agendas.
- Each of the gallery sections was visited by at least one-third of visitors, with the most stopping in Deep Frontier and the least in To Infinity and Beyond. Visitors spent the most amount of time in Living on a Restless Planet and the least in To Infinity and Beyond.

Visitation to Individual Components

Stops at Individual Components

- All of the components at which the most visitors stopped had interactive elements: Jet Pack, Explorers' Hands, 3-D Motion Control interactive, and Your Weight on the Moon.
- Four of the six least visited components were panels: They're Made Out of Meat, Destination Moon, Where to Next?, and Research in Space. The other two least visited components were the Mini-sub video and the Walking Submarine labeled environmental feature.

Time Spent at Individual Components

- The component at which visitors spent the most amount of time was the Eye on Earth computer interactive (3 minutes 8 seconds), followed by the Damaged Building Set staffed exhibit (2 minutes 3 seconds).
- Visitors spent the least amount of time at the Research in Space panel, the Destination Mars panel, and the One Small Step foot print mechanical interactive.

Comparison of Component Types³

Comparison of Total Number of Stops

- Visitors stopped at a median of four mechanical interactives, one staffed exhibit, one simulation interactive, and one panel without artifact. Visitors noticed a median of one environmental feature.⁴
- More than half of visitors did not stop at any panels with artifacts, videos, computer interactives, environmental features, or ethics exhibits.
- One statistically significant relationship was found: males stopped at more simulation interactives than females.

Comparison of Total Time

- Visitors spent the most amount of time at mechanical interactives, followed by simulation interactives, staffed exhibits, and computer interactives.
- Visitors spent less than one minute at both types of panels, videos, ethics exhibits and environmental features.

Behaviors at Interactive Components

Four behaviors at interactive components were noted during the timing and tracking observations: using interactives (i.e., physically manipulating the interactive as designers intended), waiting for interactives, selecting the Spanish-language option on computer and video components, and interacting with Museum staff.⁵

Use of Interactive Elements

Visitors used between 0 and 14 interactive elements out of 35 available. The median number of interactive elements used was three.

- Of the 21 interactives that were used by at least 50 percent of the visitors who stopped, 11 were mechanical interactives, four were computers, two were simulation interactives, two were videos, one was a staffed exhibit, and one was a combination of mechanical interactive and computer interactive.

³ For the purpose of this analysis, the components of the Exploration Gallery were classified as the following six main categories: interactive components (computer, mechanical, simulation, and staffed), videos, text and graphics panels (those with and without artifacts), environmental features (labeled and unlabeled features), and ethics exhibits (interactives, videos, or panels dealing with ethical issues). Several components were classified as more than one type.

⁴ When visitors attended to an environmental feature for less than three seconds, this was recorded as a “notice.” When visitors attended to an environmental features for more than three seconds, this was recorded as a “stop.”

⁵ When visitors stopped at panels, it was assumed that they read at least some of the text. However, when visitors stopped at interactive components they behaved in a number of ways (e.g., operating the component, watching others use the component, reading the associated text, etc.). As such, only purely observable behaviors were selected for the tracking study.

- The Jet Pack simulation interactive and the Mission Center computer interactive were used by the fewest visitors.

Data collectors also noted which interactives visitors tried to use but were unable to operate. Out of a total of 35 interactive elements, 6 proved difficult to operate for at least one visitor.

- About one-quarter of the visitors who tried to use the Lunar Freightlines mechanical interactive were unable to operate it (22 percent).

Waiting at Interactive Elements

Visitors waited to use 10 of the 65 interactive elements available. Three of the interactives had designated queues, while the other seven did not.

- Visitors waited at between zero and four interactives. More than three-fifths of visitors (63 percent) did not wait at any interactives.
- Of the 37 visitors who waited in queues, one-half (54 percent) spent 10 percent or less of their total time waiting in these designated lines.

Selection of Spanish-Language Option

The Exploration Gallery has five components at which visitors could select a Spanish version of the video or computer program. Only one visitor selected Spanish at any of these components.

Staff Interactions

The number of times visitors interacted with staff was recorded during the timing and tracking observations. Visitors could interact with gallery staff at four components (Jet Pack, Damaged Building Set, Curiosity Counter, and Special Program in the gallery), as well as with staff stationed throughout the Exploration Gallery. A staff interaction constitutes the observed visitor talking directly to staff.

- Visitors interacted with staff between zero and nine times while in the gallery.
- About three-fifths of visitors (59 percent) did not interact with any Museum staff. One-quarter of visitors (23 percent) interacted with one staff member while in the Exploration Gallery.

II. INTERVIEWS

Open-ended interviews were conducted with visitors immediately after their visit to the Exploration Gallery to gather their perceptions and opinions of the exhibition. Twenty interviews were conducted with 45 people—21 females and 24 males. Their average age was 31 years.

Gallery Content

When asked what they considered the main idea of the gallery to be, most visitors named one or more of the individual sections as the main idea, and about half named “exploration” as the main idea, along with one or more of the sections. A few visitors saw the exhibition’s main idea as learning, the technology involved in exploration, or the interactive nature of the exhibition. When specifically asked, almost all visitors named three sections in the gallery: land, ocean, and space.

Gallery Environment

As mentioned previously, most visitors left the gallery thinking that there were three main sections. For most visitors, the content matter indicated which section they were in or when they had entered a new section. Some visitors found the sections very distinct, while others found the transitions between the sections subtle.

When talking about the overall décor of the gallery, most visitors commented on the dim lighting. Some visitors mentioned how the lighting positively affected their experience in the gallery; a few, in particular, said the lighting helped them imagine they were in another place.

Planetary Base

When asked what in the gallery seemed like a recreated place, some visitors mentioned the Damaged Building Set or the ROV Tank. While most visitors had visited the Planetary Base, only 1 out of 20 visitor groups named the Base as an immersion environment. For the Base to seem more like a real place to them, visitors suggested being able to look out on Mars through Base windows (not realizing that the Base is intended to be either on Mars or on the Moon) and altering the Base structure.

Individual Components

Introductory Area

About half of the visitors noticed the Exploration Gallery introduction. Of the visitors who noticed this introductory area, some liked it and thought it set the tone for the gallery, while others found it uninteresting. Most visitors who noticed the Exploration Gallery introduction mentioned the handprints.

Ethics Exhibits

About half of the visitors noticed one or more of the ethics exhibits in the gallery. Those visitors who noticed these exhibits liked them and thought the topics were relevant and interesting. Of the visitors who did not notice the ethics exhibits, some thought they were a good idea, while others thought the topics were inappropriate for a museum.

Other Components

Overall, visitors had many positive comments about their experiences in the Exploration Gallery. Some thought the interactive nature of the gallery made it an ideal environment for children, while others felt it was well suited for adults, too.

Visitor Learning

Visitors described learning experiences in all three sections of the gallery. When asked, almost all visitors were able to name one or more specific areas in the exhibition where they had a learning experience as well as something specific that they learned. In particular, visitors mentioned that they had learning experiences while operating equipment, such as the Remote Control Planetary Rover, the ROV in the water tank, and the Jet Pack simulator.

EXECUTIVE SUMMARY: INNOVATION GALLERY

I. TIMING AND TRACKING OBSERVATIONS

The Innovation Gallery contains 50 components (self-contained exhibits for visitors to use or read), an additional four environmental features for visitors to notice, 2 barcode distributors, a set of laser printers, and 2 designated lines (queues) for waiting to use interactives.¹

Conditions of the Gallery During the Study

A total of 126 timing and tracking observations of visitors in the Innovation Gallery were conducted in July and August 1999.

- Nearly all of the trackings in the Innovation Gallery (92 percent) were conducted during moderate visitation conditions.
- Visitors stopped at between zero and five broken exhibits while in the Innovation Gallery. The median number of broken exhibits stopped at was zero.

Visitor Characteristics

In total, 28 children (ages 9 to 15 years) and 98 adults (16 years and older) were unobtrusively observed in the Innovation Gallery.

Overall Visitor Patterns in the Gallery

Total Number of Components Stopped At per Visitor²

- Visitors in the Innovation Gallery stopped at between 1 and 36 different components of the 50 available. The median number of components stopped at was 10 (i.e., 20 percent of the gallery).
- Three-quarters of visitors (76 percent) stopped at between 1 and 15 components (i.e., 2 percent to 30 percent of the gallery).

Total Time (in Minutes) Spent in Exhibition

- The shortest amount of time spent in the exhibition was 23 seconds, and the longest was 1 hour 12 minutes. The median amount of time spent was 17 minutes.

¹ Museum documentation (“Exhibit Operation and Performance Descriptions” and “Exhibit and Program Outline - Concept 3”) was used to identify and name the items (components, environmental features, etc.) listed on the timing and tracking form.

² For the purposes of this study, a “stop” was defined as a visitor standing for three seconds or longer in front of a given component. If a visitor returned to a component at which she or he had previously stopped, this return was not counted as an additional stop, but the amount of time spent was included in the total time spent at the component.

- About two-fifths of visitors (42 percent) spent between 5 and 20 minutes in the gallery.

Visitor Path

- Overall, there is very little pattern in the way visitors moved from component to component, which indicates visitors did not follow one particular path through the gallery but rather were attracted to individual components according to their own interests and agendas.
- Each of the gallery sections was visited by at least two-fifths of visitors, with the most stopping in Virtual Design and the least in Greeting from Silicon Valley. Visitors spent the most amount of time in Virtual Design and the least in Greeting from Silicon Valley.
- More than half of the visitors (54 percent) visited the Clean Room. Of those, nearly all (90 percent) entered the Clean Room through the exit.

Visitation to Individual Components

The number of stops and time spent at each component were recorded. Components were then analyzed individually and by type.

Stops at Individual Components

- The component at which the most visitors stopped was the Alphabet computer interactive with panel and artifact, followed by the Tech Cyclone roller coaster simulator and the Cyberheads image manipulation station.
- The least visited components were all text panels: Robot Tech postcard, Miniature Revolution postcard, Suit Yourself, and 3-D Scanners Offer New Tools to Artists.

Time Spent at Individual Components

- The component at which visitors spent the most time was the Design a Roller Coaster computer interactive, followed by the Cyberheads image manipulation station, and the Tech Cyclone roller coaster simulator.³
- The components at which visitors spent the least amount of time were all postcard panels: Robot Tech postcard, Miniature Revolution postcard, and Robot Tech postcard.

³ It should be noted that some visitors waited to use the Cyberheads image manipulation station and, as such, its median time includes waiting time. For the Design a Roller Coaster computer interactive and the Tech Cyclone roller coaster simulator, because there were designated lines for these components, their median times do not include waiting time.

Comparison of Component Types⁴

Comparison of Total Number of Stops

- Visitors stopped at a median of two panels with artifacts, one computer interactive, one ethics exhibit, one mechanical interactive, one staffed exhibit, and one simulation interactive.
- More than half of visitors did not stop at any panels without artifacts or any environmental features. In addition, more than half of visitors did not notice any environmental features.⁵
- Four statistically significant relationships were found: visitors without children stopped at more staffed exhibits, panels with artifacts, panels without artifacts and environmental features than did visitors with children.

Comparison of Total Time

- Visitors spent the most amount of time at computer interactives, followed by mechanical interactives, simulation interactives, staffed exhibits, and panels with artifacts.
- Visitors spent less than one minute at exhibits, environmental features, and panels without artifacts.
- Two statistically significant relationships were found: visitors with children spent more time at computer interactives than visitors without children. Conversely, visitors without children spent more time at panels with artifacts than visitors with children.

Behaviors at Interactive Components

Four behaviors at interactive components were noted during the timing and tracking observations: using interactives (i.e., physically manipulating the interactive as designers intended), waiting for interactives, selecting the Spanish-language option on computer and video components, and interacting with Museum staff.⁶

Use of Interactive Elements

Visitors used between 0 and 14 interactive elements out of 34 available. The median number of interactive elements used was three.

⁴ For the purpose of this analysis, the components of the Innovation Gallery were classified as the following five main categories: interactive components (computer, mechanical, simulation, and staffed), videos, text and graphics panels (those with and without artifacts), environmental features (labeled and unlabeled features), and ethics exhibits (interactives, videos, or panels dealing with ethical issues). Several components were classified as more than one type.

⁵ When visitors attended to an environmental feature for less than three seconds, this was recorded as a “notice.” When visitors attended to an environmental features for more than three seconds, this was recorded as a “stop.”

⁶ When visitors stopped at panels, it was assumed that they read at least some of the text. However, when visitors stop at interactive components they behaved in a number of ways (e.g., operating the component, watching others use the component, reading the associated text, etc.). As such, only purely observable behaviors were selected for the tracking study.

- Of the eight interactives that were used by at least 50 percent of the visitors who stopped, 5 were mechanical interactives, two were computers, and one was a staffed exhibit. The two interactives with the highest frequency of use were both mechanical interactives.
- Alhabot was used by the fewest number of visitors (14 percent). This is particularly interesting as, stated earlier in the report, Alhabot had the highest attraction power of all the components in the Innovation Gallery.

Data collectors also noted which interactives visitors tried to use but were unable to operate. Out of a total of 34 interactive elements, 12 proved difficult to operate for at least one visitor.

- About ten percent of visitors had difficulty operating the Dust Alert Particle Counter Room, the Building Chips video, and Postcards from the Edge (13 percent, 11 percent, and 11 percent, respectively).

Waiting at Interactive Elements

Visitors waited to use 16 of the 34 interactive elements available. Two of the interactives had designated queues, while the other 14 did not.

- Visitors waited at between zero and three interactives. Three-quarters of visitors (75 percent) did not wait at any interactives.
- Of the 45 visitors who waited in queues, more than two-fifths (44 percent) spent 10 percent or less of their total time waiting in these designated lines. About one-quarter (24 percent) spent between 20 and 40 percent of their total time waiting in queues.

Selection of Spanish-Language Option

The Innovation Gallery has seven components at which visitors could select a Spanish version of the video or computer program. Visitors selected Spanish at three of the seven components that offered this option.

- Overall, few visitors chose to view computer or video programs in Spanish: there were only seven instances of Spanish being selected out of the 126 trackings conducted (two visitors selected Spanish twice and three other visitors selected Spanish once).

Staff Interactions

The number of times visitors interacted with staff was recorded during the timing and tracking observations. Visitors could interact with gallery staff at two components (3-D Portraits and the Curiosity Counter) as well as others stationed in the Innovation Gallery. A staff interaction constituted the observed visitor talking directly to a staff person.

- Visitors interacted with staff between zero and nine times while in the gallery.

- Almost three-quarters of visitors (71 percent) did not interact with any Museum staff. One-quarter (25 percent) interacted with staff one to two times.

II. INTERVIEWS

Open-ended interviews were conducted with visitors immediately after their visit to the Innovation Gallery to gather their perceptions and opinions of the exhibition. Twenty interviews were conducted with 33 people—15 females and 18 males. Their average age was 36 years.

Gallery Content

To some visitors the Innovation Gallery explains and shows the latest technology and the applications of technology. Other visitors, affected by their experience in the Clean Room, noted that the gallery was about chip development. A few others concluded that the gallery intended to motivate people to be creative and innovative by giving them a chance to test and try things. Some visitors could not identify a primary theme, and while they said they had fun, they did not see a connection among their various experiences. Other themes that visitors identified included topics such as Computer Assisted Design, computers, motion, and different high-tech companies. These kinds of responses suggest that the experience visitors have in the gallery are defining moments—that is, visitors conclude what the gallery is about based on one or two primary experiences.

Gallery Environment

Overall, visitors easily described how they knew that they were leaving one section of the gallery and entering another. Collectively, their responses varied, with some noting simply that the content had changed or, in some cases, the objects displayed above had changed. Others said that the way exhibit components were grouped, with like components together, and that one grouping looked distinctly different from another also told them that they were leaving one area and entering another. The Clean Room, for example, was noted as being very different from the other areas. The remaining visitors each noticed different clues, including the space between components, and walking and exiting through portals. Only a few visitors were confused in the gallery, noting that it was one space with no distinctions.

Some visitors found the Innovative Gallery environment appealing, attractive, comfortable, and appropriate given the subject matter. Visitors noticed the lighting more than any other design element. The contrast between dark and light areas, as well how lights were used to spotlight components, attracted visitors and, in some cases, helped them focus their attention. According to some visitors, the variation in lighting and the colors in the gallery added “texture.”

Clean Room

Half of the visitor groups identified the Clean Room as a real-world environment that would exist outside the Museum. A few visitors, having never seen a clean room, could not say whether the Clean Room was an accurate representation. Almost half of visitor groups did not visit the Clean

Room, one of whom thought she was not permitted to enter it. About one-third of visitors identified the roller coaster as the immersion environment.

Individual Components

Introductory Area

Almost half of the visitor groups identified Postcards from the Edge as the introductory area, and about one-third did not think any of the components they visited served as an introduction to the gallery. The remaining visitors named a few other components that served as an introduction to the gallery—those that they stopped at first and those where they interacted with a staff member.

Ethics Exhibits

More than half of the visitor groups did not notice Innovation Forum, and of those that did, only two made a recording. Of those who selected not to participate, some visitors did not want to wait on long lines while others said they were uninterested. When visitors were asked their opinion about museums having ethics exhibits, the majority had positive opinions either about hearing from other visitors or learning about the effects of technology.

Other Components

Overall, people had positive experiences with most of the exhibits in the Innovation Gallery. Comments such as “neat,” “pretty cool,” “a lot of cool things to do” were common summation remarks. Some visitors praised the workbench exhibits, but others criticized them because either the components were broken or they did not have a clear idea how to use them.

Visitor Learning

The Clean Room and workbenches were the two areas mentioned most often by visitors when asked about their learning experiences. According to visitors’ responses, learning is closely aligned with seeing something that they have never seen before and being exposed to information that adds to their existing knowledge base. Few visitors talked about specific facts that they learned.

EXECUTIVE SUMMARY: LIFE TECH GALLERY

I. TIMING AND TRACKING OBSERVATIONS

The Life Tech Gallery contains 65 components (self-contained exhibits for visitors to use or read), an additional 6 environmental features for visitors to notice, 1 barcode distributor, a set of printers, and 2 designated lines (queues) in which visitors could wait for an interactive.¹

Conditions of the Gallery During the Study

A total of 115 timing and tracking observations of the Life Tech Gallery were conducted in July and August 1999.

- Nearly all of the trackings in the Life Tech Gallery (90 percent) were conducted during moderate visitation conditions.
- Visitors stopped at between zero and three broken exhibits while in the Life Tech Gallery. The median number of broken exhibits stopped at was one.

Visitor Characteristics

In total, 27 children (ages 9 to 15 years) and 88 adults (16 years and older) were unobtrusively observed in the Life Tech Gallery.

Overall Visitor Patterns in the Gallery

Total Number of Components Stopped At per Visitor²

- Visitors stopped at between 1 and 34 different components of the 65 available. The median number of components stopped at was 11 (i.e., 17 percent of the gallery).
- Four-fifths of visitors (82 percent) stopped at between 1 and 18 components (i.e., 2 percent to 28 percent of the gallery).

Total Time (in Minutes) Spent in Exhibition

- The shortest amount of time spent in the exhibition was 14 seconds, and the longest was 1 hour 3 minutes. The median amount of time spent was approximately 16 minutes.

¹ Museum documentation (“Exhibit Operation and Performance Descriptions” and “Exhibit and Program Outline - Concept 3”) was used to identify and name the items (components, environmental features, etc.) listed on the timing and tracking form.

² For the purposes of this study, a “stop” was defined as a visitor standing for three seconds or longer in front of a given component. If a visitor returned to a component at which she or he had previously stopped, this return was not counted as an additional stop but the amount of time spent was included in the total time spent at the component.

- Almost two-thirds of visitors (64 percent) spent between 1 and 25 minutes in the gallery.

Visitor Path

- Overall, there is very little pattern in the way visitors moved from component to component, which indicates visitors did not follow one particular path through the gallery but rather were attracted to individual components according to their own interests and agendas.
- Each of the gallery sections was visited by at least half of visitors, with the most stopping in Perspective and the least in the Med Tech. Visitors spent the most amount of time in Life's New Frontiers and the least in Perspective.

Visitation to Individual Components

Stops at Individual Components

- The components at which the most visitors stopped were the Transformations photo booth, Seeing with Heat thermo camera, On a Roll, and Virtual Bobsled.
- All of the least visited components were panels: Beginnings, Spiral of Life, Alphabet of Life, Are You Ready for Gene Therapy?, The One and Only You, and Gear for Going Places.

Time Spent at Individual Components

- The component at which visitors spent the most time was the Genetic Rescue computer, followed by View an Eyewitness Account computer.
- Visitors spent the least amount of time at two panels: Spiral of Life and The One and Only You.

Comparison of Component Types³

Comparison of Total Number of Stops

- Visitors stopped at a median of three computer interactives, three mechanical interactives, one environmental feature, and one simulation interactive. Visitors noticed a median of one environmental feature.
- About three-quarters of visitors did not stop at any of the ethics exhibits, staffed exhibits, panels with artifacts, or panels without artifacts.

³ For the purpose of this analysis, the components of the Life Tech Gallery were classified as the following five main categories: interactive components (computer, mechanical, simulation, and staffed), videos, text and graphics panels (those with and without artifacts), environmental features (labeled and unlabeled features), and ethics exhibits (interactives, videos, or panels dealing with ethical issues). Several components were classified as more than one type.

- One statistically significant relationship was found: visitors with children stopped at more simulation interactives than visitors without children.

Comparison of Total Time

- Visitors spent the most amount of time at computer interactives, followed by mechanical interactives, simulation interactives, and staffed exhibits.
- Visitors spent less than one minute at environmental features, both types of panels, and ethics exhibits.
- Four statistically significant relationships were found. Visitors under 45 years of age spent more time at simulation interactives and computer interactives than visitors 45 years or older. Visitors with children spent more time at simulation interactives than visitors without children. Women spent more time at computer interactives than men.

Behaviors at Interactive Components

Four behaviors at interactive components were noted during the observations: using interactives (i.e., physically manipulating the interactive as designers intended), waiting for interactives, selecting the Spanish-language option on computer and video components, and interacting with Museum staff.⁴

Use of Interactive Elements

Visitors used between 0 and 26 interactive elements out of 55 available. The median number of interactive elements used was 4.

- One statistically significant relationship was found: visitors under the age of 45 years used more interactive elements than visitors 45 years and older.
- Of the 27 interactives that were used by at least 50 percent of the visitors who stopped, 19 were mechanical interactives, 6 were computers, 1 was a theater, and 1 was a staffed exhibit.
- The elements that were used by the least number of visitors were Genes and Breast Cancer video and the MRI Machine sound button (each used by two or fewer visitors). No visitors used the Genetic Testing – Yes or No? voting slots.

Data collectors also noted which interactives visitors tried to use but were unable to operate. Out of a total of 55 interactive elements, 6 proved difficult to operate for at least one visitor.

⁴ When visitors stopped at panels, it was assumed that they read at least some of the text. However, when visitors stopped at interactive components they behaved in a number of ways (e.g., operating the component, watching others use the component, reading the associated text). Thus, only purely observable behaviors were selected for the tracking study.

- Over one-third of the visitors who tried to use Your Genetic ID computer and mechanical interactive were unable to operate it (38 percent).

Waiting at Interactive Elements

Visitors waited to use 6 of the 55 interactive elements available. Two of the interactives had designated queues, while the other four did not.

- Visitors waited at between zero and three interactives. Nearly three-quarters of visitors (72 percent) did not wait at any interactives.
- Of the 29 visitors who waited in queues, one-third (35 percent) spent 5 percent or less of their total time waiting in these designated lines. One-quarter (24 percent) spent 20 percent or more of their total time waiting in queues.

Selection of Spanish-Language Option

The Life Tech Gallery has 12 components at which visitors could select a Spanish version of the video or computer program. Visitors did not select Spanish at any of the components that offered this option.

Staff Interactions

The number of times visitors interacted with staff was recorded during the timing and tracking observations. Visitors could interact with gallery staff at the Curiosity Counter, in the Life Tech Theater, and during special programs in the gallery as well as with staff stationed throughout the Life Tech Gallery. A staff interaction constituted the observed visitor talking directly to staff.

- Visitors interacted with staff between 0 and 9 times while in the gallery.
- Three-quarters of visitors (74 percent) did not interact with any Museum staff.

II. INTERVIEWS

Open-ended interviews were conducted with visitors immediately after their visit to the Life Tech Gallery to gather their perceptions and opinions of the exhibition. Twenty interviews were conducted with 37 people—26 females and 11 males. Their average age was 32 years.

Gallery Content

Visitors' understanding of the primary and secondary themes fell into two predominant categories: almost half understood Life Tech to be solely about health and the human body, while several others talked about the gallery as presenting a relationship between technology and the human body. Those who offered the latter response talked about how technology improves or enhances how we use our body.

Gallery Environment

Almost half of visitors did not really notice that they were moving from one section of the exhibition to another, but several others commented that sections became obvious by the way the components were clustered (i.e., components about one idea were grouped together). Several other visitors recognized they were moving from one section to another because the concepts that were being presented changed.

More than half of visitors noticed the lighting in the gallery, but their remarks covered a range of opinions. A few found the gallery too dark, a few found the gallery well lit and the lighting complementary to the exhibits, and a few others appreciated the contrast in lighting—noting that there were dark areas adjacent to highlighted areas. Some visitors also noticed the colors in the gallery. Again, a range of opinions was offered. Some liked that the gallery was colorful and bright, and one interviewee praised its subtlety.

Operation Theater

More than one-half of visitors identified the Operation Theater as the real-world environment. One-quarter of visitors never walked into the surgery area, and a few could not identify any area as representing a real-world environment. One-fifth of visitors identified the MRI and one-fifth identified the Bobsled as real-world environments.

Individual Components

Introductory Component

No interviewees correctly identified the Life Tech sign and videos introduction as the introductory component.

Ethics Exhibits

Half of interviewees visited one or more of the ethics exhibits, and half did not. Visitors who did not visit the ethics exhibits either did not see them, walked by them, or were engaging only in the hands-on exhibits. When interviewees were asked their opinion about having ethics exhibits in museums, nearly all felt positive about it.

Other Components

Overall, people thought Life Tech was “extremely interesting.” They liked the hands-on quality of the exhibits and that some of the exhibits provided virtual experiences. Few visitors mentioned specific exhibits when they were talking about the gallery’s attributes, probably because they had trouble describing or naming the exhibit to which they were referring. Visitors’ negative remarks centered on exhibits that they thought were either broken or confusing to operate.

Visitor Learning

Collectively, interviewees mentioned many, many exhibits when discussing what they had learned, but Keyhole Surgery was mentioned more than any other exhibit. Discovering new information (e.g., the index finger is shorter in females than in males), trying new experiences (e.g., racing in a wheelchair), and seeing what is normally hidden from view (e.g., body heat) all constituted visitors' learning experiences.